Universal PreK and Local Labor Markets*

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Abstract

Research shows that expanding access to affordable child care can benefit children and parents, but its broader economic impacts remain unclear. We address this by analyzing data from nine states and cities that implemented Universal Pre-Kindergarten (UPK) programs between 1995 and 2020. We exploit the staggered implementation of UPK across locations to isolate its effects from other potentially confounding factors. On average, UPK increased Pre-K enrollment among four-year-olds by 4 to 8 percentage points, with some shifting from private to public providers. Regions with UPK saw a 0.9 percentage point increase in labor force participation, a 0.9 percentage point rise in employment, and a 1.7 percent increase in hours worked. We also document a shift from part-time to full-time employment, as well as evidence of a transition from unemployment to employment—underscoring the importance of examining multiple margins of labor market adjustment. While we find larger effects for mothers of young children—as observed in other studies—we also document sizable effects on the broader adult population. Another contribution is that we document that UPK's employment effects vary, with the largest impacts in UPK programs enrolling a high share of four-year-olds. Although the effects on the average hourly wage were negligible (suggesting highly elastic aggregate labor demand), after accounting for population size, aggregate earnings grew by approximately 2.3 percent. Each dollar spent on public Pre-K expansion was associated with between $6 and $10 in local aggregate earnings—effects large enough that tax revenues could offset the cost of providing UPK.

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1 Introduction

Universal Pre-Kindergarten (UPK) is a cornerstone of modern supply-side economics, which prioritizes (among other things) labor supply, human capital, and public infrastructure (Yellen, 2024; House Budget Committee, 2021). While UPK can increase economic output in the long run by increasing worker skill (e.g., Gray-Lobe et al. (2022); Berne (2022)), it is also theorized to spur macroeconomic growth in the *short run* by increasing labor supply and enhancing productivity (Daniela Viana Costa, 2021; Belfield and Neveu, 2006). Evidence from specific states and cities suggests UPK *can* increase parental labor supply (Cascio and Schanzenbach, 2013; Humphries et al., 2024a; Malik, 2018; Marifian, 2021). However, these effects are inconsistent across contexts (Fitzpatrick, 2010; Cascio, 2021), and many large-scale U.S. UPK programs remain unstudied. As a result, it remains uncertain how reliably large-scale UPK programs may boost maternal labor supply nationwide. Moreover, most research focuses on the partial-equilibrium UPK effects on parents (almost exclusively mothers) of preschool-age children, leaving broader, market-level impacts underexplored. This study seeks to fill these gaps by analyzing the effects of several major UPK programs not only on maternal labor force participation, but also on overall employment and local labor markets. Finally, we help make sense of some mixed results in the extant literature by exploring whether more ambitious UPK programs generate greater benefits.

While much of the existing literature has focused on how UPK may affect labor market participation among mothers with young children, this may not fully capture its broader labor market effects for several reasons. First, higher labor force participation among young mothers could crowd out employment for other workers (Fukui et al., 2023), potentially reducing the net labor market gains. Second, because about 20% of U.S. adults are informal caregivers for family members or friends (Edwards, 2020)[1], and between one-third and one-half of children under five receive informal care from family, friends, or neighbors (Early Edge California, 2024), UPK's employment effects may extend well beyond mothers. Third, UPK could influence the labor decisions of potential mothers through anticipatory effects. Finally, broader demand-side impacts (such as increased demand for restaurants or transportation) due to additional workers, would go undetected by focusing solely on directly affected parents. For all of these reasons, we focus on the broader labor market effects of UPK, which, while related to the effects on parents (typically mothers) of children receiving care, represents a distinct and equally important policy parameter. Moreover, we explicitly examine whether these parameters are the same across states with varying program design and implementation.

Over the past several decades, many states have offered subsidies for PreK programs. These have key differentiating features, such as part-day versus full-day schedules, eligibility standards, and the pace of implementation. Indeed the spending per enrollee varies widely, with

[1]Based on the BRFSS, a random-digit-dialed survey of non-institutionalized U.S. adults aged 18 and older, conducted across all 50 states, DC, and three U.S. territories.

D.C. (the most ambitious PreK program in the United States) spending $22,207 per enrollee compared to $3,142 per enrollee in Florida in 2023. Combining data from various sources, we use the states listed in Table 1 to define our sample of Universal PreK states. These states all have programs that are open to all students, regardless of income or family characteristics and serve at least 50% of the four-year-old population as of 2019. To avoid confounding policy effects with disruptions during the COVID-19 Pandemic, we focus on Universal PreK programs implemented in nine states and major cities that had programs in place before 2020. These include Georgia, Oklahoma, West Virginia, Florida, Iowa, Wisconsin, D.C., Vermont, and New York City. Table 1 provides more details on these areas.[2]

Table 1: Details of States and Cities PreK Programs (as of 2023)

State/City	% 4y/o Enrolled	% Districts Offering PreK	State Spending Per Enrolled	NIEER Ranking	Year Implemented
Georgia	56	100	$5,646	9	1995
Oklahoma	67	100	$4,798	3	1998
West Virginia	67	100	$7,053	4	2002
Florida	67	100	$3,142	2	2005
Iowa	67	98	$3,705	5	2007
Wisconsin	63	99	$3,831	7	2008
District of Columbia	88	100	$22,207	1	2009
Vermont	71	100	$8,244	6	2014
New York City*	67	100	$6,101	3.5	2014

Notes: Implementation year is defined as the year the initial policy took effect or was funded. Years are taken directly from NIEER unless otherwise noted. NIEER rankings are NIEER's 4 year-old access rankings from the most recent year available (2022-23) Georgia's program was launched in 1992 and expanded in 1995 (NIEER, pg. 58). Oklahoma's program was launched in 1980 and became available to students in all districts via funding in 1998 (NIEER, pg. 124). West Virginia passed legislation mandating that UPK be available by 2012; we use 2002 because it marks the beginning of the roll-out (NIEER, pg. 158). Wisconsin's Constitution, enacted in 1848, includes a promise to provide free K4 education, though it is not mandatory for districts to offer PreK (K4). A 2007 law, enacted in 2008, incentivized districts to offer PreK access by offering 4K startup grants. For DC, see Sec. 608, PreK Enhancement and Expansion Act, which was passed in 2008 but was implemented in 2009. New York established Universal PreK in 1998 and expanded the program significantly in 2014 by establishing the Statewide Universal Full-Day Prekindergarten Program (SUFDPK), which predominantly funded NYC and began Universal PreK in NYC (NIEER, pg. 116). *Data for NYC are imputed based on reported state data. According to New York State records, New York City accounted for 50.04 percent of all pre-K enrollment in 2023. Additionally, ACS data indicate that New York City has made up approximately 40 percent of New York State's population over the past decade. Using these two facts, we infer that New York City's enrollment rate is approximately 1.2 times the New York State enrollment rate. As such, we impute the New York City enrollment rate by multiplying the reported New York State enrollment rate by 1.2. We then assign New York city the same NIEER ranking as that of other states with the same enrollment rate as that imputed value.

We use several publicly-available datasets in our analysis. To measure PreK enrollment,

[2]Note that we do not include New Mexico or Alabama, two states that–by some measures–have implemented universal eligibility PreK programs. Alabama and New Mexico have very low rates of enrollment in their PreK programs despite universal eligibility (32% and 38%, respectively as of 2021). We restrict to states that enroll at least 50% of eligible four-year olds, which omits New Mexico, Alabama, California, and New Jersey.

we use data from the October supplement of the Current Population Survey, the American Community Survey, and data collected by the National Institute for Early Childhood Research (NIEER). We measure labor market outcomes for individuals from both the Annual Social and Economic Supplement (ASEC) of the Current Population Survey (CPS), and the American Community Survey (ACS).

To isolate the effect of the introduction of Universal PreK on outcomes from underlying differences across places, we compare the *change* in outcomes before versus after the introduction of Universal PreK to changes in other areas that did not introduce Universal PreK. Exploiting this variation, we use a stacked difference-in-differences approach to estimate the effects in an event-study framework. This approach identifies the causal effect of introducing PreK on outcomes so long as there were no other changes in market forces (or other labor market policies) at the same time that would have affect local markets. While we cannot entirely rule out this possibility, we (a) show that outcomes in places that implemented UPK had similar trajectories to UPK places, and (b) show that our results are robust to including strong predictors of labor market outcomes.

On average, areas that introduced Universal PreK saw an increase in the share of four-year-olds enrolled in public PreK of between 12 and 21 percentage points over the subsequent five years, compared to other regions. While we find evidence of substantial crowd-out from private Pre-K (consistent with prior research), on average, areas that introduced Universal PreK saw an increase in the share of four-year-olds enrolled in *any* form of PreK by about 7 percentage points over the subsequent five years, compared to other regions.

Looking to overall economic activity, the introduction of UPK was associated with a 0.7 percentage point increase in labor market participation and a 0.9 percentage point increase in employment. To reconcile an employment response that is larger than the labor force participation increase, we also examined changes in unemployment. We found that UPK is associated with a decline in unemployment, indicating that expanding access to child care made it easier for those looking for a job to find one or accept one - that is UPK improved job matching.

To shed light on mechanisms, we also examine the effects on mothers of young children. Consistent with prior work, among mothers of young children, UPK was associated with a 3-percentage-point increase in labor market participation, a 2.9-percentage-point increase in employment, and a 1.5-hour increase in weekly hours worked. Because mothers of young children comprise only 6 percent of the adult working population, without spillover effects to other groups, the implied aggregate increases would be a 0.18-percentage-point increase in labor force participation and a 0.17-percentage-point increase in employment. The actual aggregate effects are more than 400 percent larger than those implied by the effects on mothers of young children alone—indicating that UPK has significant effects beyond those experienced by parents of directly affected children. Formal tests confirming that the aggregate effects exceed those implied by parental effects (assuming no spillovers) yield a p-value below 0.01.

In a supply-demand system, an increase in supply that leads to an increase in employment would also result in a decrease in the equilibrium wage. Consistent with this, we find evidence of a modest decrease in wages (though statistically insignificant), implying highly inelastic demand. Because the change in wage was negligible, the introduction of Universal PreK corresponded to approximately a 1 percent increase in total aggregate income earned, depending on the data source, indicating real, positive social benefits overall.

To determine whether these effects reflect the impact of UPK itself (rather than other factors correlated with its introduction), we analyze whether employment effects are more pronounced in areas with larger increases in public PreK enrollment. Indeed, across treated areas, a 10-percentage-point increase in the share of four-year-olds enrolled in public PreK is associated with a 0.45-percentage-point increase in the share of adults employed. An even stronger predictor of labor force participation effects is the *NIEER access rating*—highlighting the importance of both quality and access. These patterns across settings help bolster the case for causal relationships. In addition to the checks mentioned above, we show that the estimated impact of merely having a UPK program *per se*—without any enrollment response—is effectively zero. While no single piece of evidence is dispositive, the combined results strongly suggest a causal relationship between increases in PreK enrollment (driven by UPK implementation) and greater economic activity.

To further reinforce this heterogeneity, we conduct a full event study analysis of outcomes in Washington, D.C., home to the most ambitious Universal PreK program in the United States. Our analysis reveals that the D.C. UPK program had substantial aggregate effects. Specifically, the program increased labor force participation by 1.7 percentage points, employment by 1.7 percentage points, and overall wages by 6.4 percent—all significantly larger than the average effects observed in less ambitious UPK programs.

To quantify the impact of UPK on the economy, we relate increases in public PreK spending to corresponding increases in aggregate earnings. Each dollar spent on public PreK generated between 6 and 10 dollars in additional aggregate earnings. This is sufficiently large that the increase in federal and state taxes would be enough to cover the cost of the UPK program.

The remainder of the paper is structured as follows: Section 2 details the data, and Section 3 describes our identification strategy. We document the effect of UPK implementation on Pre-K enrollment and aggregate labor market outcomes in Sections 4 and 5, respectively. We underscore the extent of effect heterogeneity, and in Section 6, we highlight the substantial effects observed in a model UPK program. This is followed by an analysis of the impact on aggregate earnings in Section 7 and conclusions in Section 8.

2 Data

Our analysis draws on multiple nationally representative datasets, facilitating a detailed examination of how Universal PreK programs impact, preschool enrollments, individual labor

market decisions, and aggregate economic outcomes. This section outlines each data source, detailing its scope, time coverage, frequency, and key variables used in our analysis.

Enrollment Data

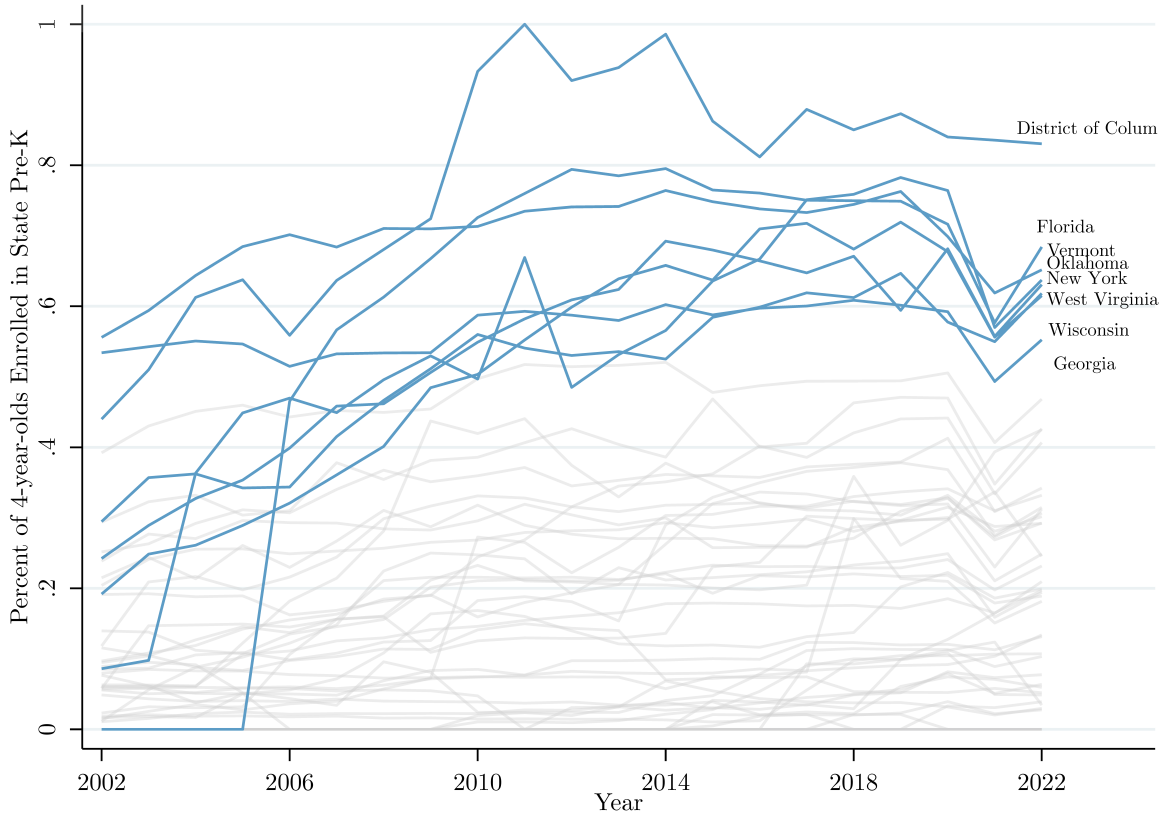
To analyze PreK enrollment trends in the United States, we rely on three complementary datasets: the American Community Survey (ACS), the Current Population Survey (CPS), and data from the National Institute for Early Education Research (NIEER). Together, these datasets provide a comprehensive view of PreK enrollment and public PreK funding patterns over time and across geographic areas.

The NIEER data, spanning 2002 to 2023, offers a detailed focus on publicly funded PreK programs at the state level. NIEER compiles its annual State of Preschool Yearbooks using data from various state education agencies, budget documents, legislative reports, and related sources to provide a comprehensive overview of public PreK programs.[3] It includes enrollment data, such as the number and percentage of 3- and 4-year-olds enrolled in public PreK, as well as total state public PreK enrollment. NIEER also tracks spending through measures like total state PreK spending and per-child spending (adjusted to 2023 dollars), and evaluates adherence to quality benchmarks, including teacher qualifications, class sizes, and instructional time. While NIEER does not capture private PreK enrollment, its detailed focus on public programs and funding makes it an essential resource for understanding state-level investments in early childhood education. Policymakers, researchers, and educators rely on NIEER state reports to assess progress, address disparities, and identify opportunities for improving state-funded early education.

Figure 1 plots the enrollment in state-funded PreK from 2002 (when the data series begins) through 2022 by state in the NIEER data. Over time, there has been a general trend towards more four-year-olds being enrolled in publicly funded PreK as more states and localities implementing some form of publicly funded PreK for four-year-olds over time. In 2002, nationally, the average enrollment in publicly funded PreK was 15%, while by 2022, it increased to 37%. Not surprisingly, states that implemented UPK have much higher shares of four-year-olds enrolled in publicly funded PreK than other areas. Indeed, the eight states with the highest share of four-year-olds in publicly funded PreK (excluding NYC, as it is not a state) are all UPK states. However, many UPK states had average enrollment levels in the early 2000s but saw sizable increases in enrollment after the implementation of UPK, as our analysis will show.

[3] State Departments of Education, such as those in California and New York, supply key information on enrollment, funding, and policies. Specialized offices like Connecticut's Office of Early Childhood and Georgia's Department of Early Care and Learning (DECAL) offer detailed insights into early education initiatives. NIEER also reviews budget documents and legislative reports to track funding allocations, occasionally validating state-reported figures with data from federal agencies like the NCES. These diverse sources enable NIEER to present detailed, state-level data on enrollment trends, funding, and quality standards for public PreK programs nationwide.

Figure 1: Enrollment in State PreK By State 2002-2022



Note: Figure shows the share of state population of four-year-olds enrolled in state-sponsored PreK. Highlighted states are those included in the treatment group. All other states are shown in gray. Data from NIEER are used. Note that New York indicates New York City.

For our analysis, we seek to examine enrollment not just in publicly funded PreK, but PreK overall. We also aim to examine outcomes before 2002. As such, we use other data sources as well. The CPS October Supplement is a valuable resource for tracking PreK enrollment trends over a long period of time (covering 1976 to 2023). The CPS surveys families and asks questions about the educational attainment and enrollment of each member of the household. It also offers individual-level data that distinguishes between public and private PreK enrollment rates by age. However, the CPS, which typically surveys around 60,000 households annually, has a relatively small sample size – limiting the precision of estimates, particularly for smaller geographic areas or subpopulations. This motivates our use of the ACS data.

The ACS surveys approximately 3.5 million households annually, providing a much larger dataset than the CPS. This larger sample size allows for greater precision in estimating enrollment trends, especially at the state and city levels. However, these data only exist starting in 2001 and only reliably cover years 2005 to 2022 – making the CPS the only option for the study

of overall PreK enrollment in early UPK states.[4] The ACS includes the same enrollment variables as the CPS, so to leverage the advantages of both datasets, we use ACS data when possible and rely on the CPS otherwise. Specifically, for analyses of states that implement UPK before 2007, we use the CPS, and use the ACS for states (and sub-state geographic) that implemented UPK after 2007.[5]

Labor Market Outcomes

The core of our analysis combines labor market data from the Current Population Survey (CPS) and the American Community Survey (ACS), which together provide rich information on employment, labor force participation, and wages at both the individual and household levels. We use data from both the ACS and CPS to construct a panel of labor market spanning the introduction of UPK programs from 1995 to the present. For labor market outcomes, we rely on the Annual Social and Economic Supplement (ASEC) of the CPS, conducted in March, which surveys approximately 90,000 households. The CPS is used to measure outcomes prior to 2005, as the ACS only became consistently available in 2005. For outcomes after 2005, we favor the ACS due to its larger sample size.[6]

For our analysis, we aggregate the data to create a state-by-year panel spanning 1990 to 2019, treating New York City (NYC) as its own state. Within New York, we separate NYC from the rest of the state, designating NYC as a UPK area while the remainder of New York State is treated as a non-UPK area. For UPK introductions that occurred before 2007 (in Georgia, Oklahoma, West Virginia, Florida, and Iowa), we rely exclusively on CPS data to analyze effects, meaning that each "stack" (as discussed below) uses CPS data for all outcome years. For areas implementing UPK in 2008 and later, where ACS data provide pre- and post-implementation observations, we use the ACS for all outcomes. Although results are similar when using CPS data exclusively, the larger sample size of the ACS yields considerable precision gains. Table 2 presents summary statistics for treated and untreated areas, both before and after 2008.

Table 2 shows that UPK and non-UPK areas are largely similar. Before 2008, both areas had employment rates close to 70 percent (73 percent for non-treated areas and 72 percent for treated areas) and labor force participation rates close to 76 percent (77 percent for non-treated areas and 76 percent for treated areas).[7] In both sets of areas, the share of full-time workers was close to 55 percent (55 percent for non-treated areas and 56 percent for treated areas), and hours worked per week were close to 28 (27.8 for non-treated areas and 28.2 for treated areas). While the treated areas had slightly lower wages than non-treated areas before 2001 ($43,500 for non-treated areas versus $41,200 for treated areas) and slightly more Black residents (11

[4]The ACS data exist starting in 2001, but were experimental until 2005. After this point, the ACS data can be reliably used for sub-state level analysis.

[5]Note that all analyses are robust to using only the CPS data, but are much more precise when employing the larger sample facilitated by the CPS.

[6]Table A.1 demonstrates that the two data sources yield comparable estimates for our outcome variables of interest. Additional results using only ACS data and only CPS data are provided in the Appendix.

[7]Both ACS and CPS analyses use employment indicators that capture employment in the previous week.

percent for non-treated areas versus 17 percent for treated areas), by and large, the UPK and non-UPK areas are largely representative of the United States as a whole.

Table 2: Summary Statistics Before and After 2008 for Treated and Non-Treated Groups

	Not Treated		Treated	
	Pre-2008	Post-2008	Pre-2008	Post-2008
Employment (last week)	0.73	0.70	0.72	0.69
	[0.45]	[0.46]	[0.45]	[0.46]
Labor Force Participation	0.77	0.75	0.76	0.74
	[0.42]	[0.44]	[0.43]	[0.44]
Full-time Employment status	0.55	0.51	0.56	0.53
	[0.50]	[0.50]	[0.50]	[0.50]
Hours worked (last week)	27.8	26.3	28.2	26.5
	[21.3]	[21.0]	[21.4]	[21.0]
Annual average wages	43,595	46,414	41,158	44,099
	[60,821]	[72,702]	[58,684]	[72,702]
White	0.83	0.79	0.79	0.74
	[0.38]	[0.44]	[0.41]	[0.44]
Black	0.11	0.12	0.17	0.18
	[0.32]	[0.39]	[0.37]	[0.39]
Asian	0.01	0.06	0.01	0.05
	[0.12]	[0.22]	[0.11]	[0.22]
Female	0.51	0.51	0.51	0.51
	[0.50]	[0.50]	[0.50]	[0.50]
Age	39.4	41.0	39.7	41.1
	[12.9]	[13.7]	[13.0]	[13.7]
Percent in PreK	65.3	63.2	71.3	72.9
	[11.6]	[12.6]	[10.0]	[12.9]
Percent in Public PreK	34.1	37.7	46.1	53.7
	[10.9]	[12.9]	[13.3]	[14.4]
Percent in Private PreK	31.2	25.5	25.1	19.3
	[11.0]	[10.8]	[11.5]	[9.2]
Percent in Part Time PreK	36.4	30.4	29.4	29.3
	[12.3]	[12.8]	[14.1]	[14.1]
Percent in Full Time PreK	28.9	32.8	41.2	43.5
	[13.1]	[14.2]	[16.5]	[16.8]

Notes: Table shows 2000–2019 summary statistics before and after 2008 for treated and non-treated states using the CPS ASEC sample. Standard deviations are given in brackets. Appendix Table A.1 shows similarities between the CPS and ACS.

3 Empirical Strategy

Our analytic approach compares changes in outcomes for areas that implemented Universal PreK (UPK) before and after its introduction. To account for underlying changes that may have occurred absent UPK, we compare these changes to those observed in *other* areas during the same time period. To avoid conflating UPK impacts with the effects of the pandemic, we limit our analysis to data through the end of 2019. For the most recent implementing areas, this allows us to observe outcomes up to five years post-implementation. To ensure a balanced panel, we focus on outcomes in the four years before and the four years after UPK implementation.

To avoid using areas that have already implemented UPreK as a comparison for those implementing it over time, we use a stacked difference-in-differences model. For each treated area, we create a stack that includes the treated area along with all areas that remained untreated (using our definition) throughout the sample period. This approach compares the change in outcomes before and after UPreK implementation in each treated area against the changes in all untreated areas during the same time, averaged across all treated areas. Although the areas used as control states in this analysis do not have defined or yet-implemented UPK programs, many do offer some version of subsidization for child care, and data from NIEER show a non-zero rate of enrollment in state child care programs among four-year olds in control states. As such, our results represent changes in UPK areas relative to smaller changes that may be occurring in comparison areas.

Each stack (one for each treated unit, g) represents a dataset. These group g datasets are then appended to create a single stacked dataset, which includes a mini-dataset for each treatment-area group. We estimate models as below for outcome Y for each area s, in treated group g, in each year t, Y_{sgt}.

$$Y_{sgt} = \sum_{\tau=-6}^{5} \beta_\tau (UPK_s \times 1_\tau) + \gamma_s + \gamma_{t,g} + \varepsilon_{sgt} \tag{1}$$

Here, Y_{st} denotes the outcome of interest for area s in year t, UPK_s equals one if area s has implemented UPK within our sample period. For treated schools, τ is the year relative to the year of UPK implementation (i.e., event time), while for non-treated units, τ is -7. 1_τ equals 1 for all observations of UPK areas during year τ. In (1), the subscript g connotes the stack g. To (a) account for differences in time effects for different kinds of areas, and (b) ensure that never-treated areas are the basis for comparison, we include stack-by-year fixed effects γ_{gt}. Finally, ε_{sgt} is a area-level error term that can vary by stack (for comparison areas that are used for more than one treated area). Standard errors are clustered at the area level. This is essentially the stacked difference-in-difference used in Cengiz et al. (2019), Deshpande and Li (2019), and Jackson (2023).

The β_τ map out the evolution of outcomes in the UPK areas relative to the comparison areas before and after implementation of UPK. To estimate an average treatment effect, we compute the difference between the average effect for the five years before the implementation of UPK

(i.e., $t-5$ through $t-1$), and that for the five years after (i.e., $t=0$ through $t+5$).

In this analysis, it is crucial that the control group states closely resemble the UPK areas to ensure they follow similar pre-period trends and experience comparable time shocks, satisfying the common trends assumption. The event study framework accounts for a range of potentially confounding factors with state and year fixed effects, which control for time-invariant differences across states as well as common nationwide shocks. However, to further account for regional differences, our preferred specification includes region-by-year fixed effects as an additional control. These effects account for the possibility that locations within the same region share common time shocks, such as regional economic fluctuations or policy changes, that may not be fully captured by broader time controls. Functionally, this adjustment is equivalent to matching each UPK state with all other UPK states in the same region, improving the validity of the comparison and reinforcing the robustness of our findings.[8]

4 Effect on PreK Enrollment

To assess whether the implementation of UPK policies led to increased enrollment in publicly funded PreK programs, we analyze the impact of UPK on public PreK enrollment. While data on PreK enrollment are imperfect, the most reliable source is the NIEER dataset, which has been available since 2002. To ensure the validity of the NIEER data, we cross-check it with public school enrollment data from the October supplement of the CPS and the ACS.

Table 3 uses NIEER, CPS, and ACS data to compare enrollment before and after the introduction of UPK. Across datasets, we find large increases in public PreK enrollment (between 10 and 20 percentage points), some crowdout with decreases in private PreK (between 3 and 8 percentage points), and an overall increase in total enrollment (between 7 and 9 percentage points). Note that while ACS and CPS measure both public and private PreK, NIEER data only captures publicly funded enrollment.

Figure 2 illustrates how the percentage of four-year-olds enrolled in PreK changes in areas that implemented UPK compared to states that did not. The figure displays event study estimates spanning five years before and six years after UPK implementation. We also present the average effects for the five pre-treatment years and the six post-treatment years, along with their respective confidence intervals. We also report the pre-post change and the statistical significance of this change in the figure notes.[9]

Using the NIEER data to analyze public PreK enrollment in panel (a), we observe little

[8] We also test a Bartik-style control variable using a shift-share approach. The Bartik controls are created by multiplying the 1990 state-level industry shares (from before any state introduced UPK) by the corresponding national industry growth rates in employment and labor force participation, and then aggregating the results at the state-year level. These provide predicted growth measures that account for expected changes in labor market outcomes based on each state's industrial structure in 1990 and national economic trends. We show results including both region by year FE and Bartik controls in Table A.4, but prefer a specification with region byyear fixed effects only for its relative parsimony. Results are similar across specifications.

[9] The pre- and post-treatment averages are calculated as precision-weighted averages of the respective estimates, and the reported change represents the difference between these two precision-weighted averages.

Table 3: Details of PreK Enrollment and Spending Before and After UPK Implementation (as of 2023)

	Before UPK		After UPK		Difference	
	Mean	S.E.	Mean	S.E.	Mean	S.E.
Percent Enrolled in Public PreK (CPS)	42.7	2.3	52.6	2.1	9.9	3.1
Percent Enrolled in Public PreK (ACS)	36.8	2.0	53.8	1.8	17.0	2.7
Percent Enrolled in Public PreK (CPS + ACS)	35.9	1.7	50.8	1.5	14.9	2.3
Percent Enrolled in Public PreK (NIEER)	39.1	4.4	59.2	4.1	20.1	6.0
Percent Enrolled in Private PreK (CPS)	24.9	1.5	22.0	1.4	-3.0	2.0
Percent Enrolled in Private PreK (ACS)	29.0	1.4	20.6	1.2	-8.4	1.8
Percent Enrolled in Private PreK (CPS + ACS)	27.3	1.2	21.0	1.1	-6.3	1.7
Percent Enrolled in PreK (CPS)	67.6	2.4	74.5	2.2	6.9	3.3
Percent Enrolled in PreK (ACS)	65.8	1.9	74.3	1.7	8.6	2.6
Percent Enrolled in PreK (CPS + ACS)	63.2	1.7	71.8	1.6	8.6	2.4
Public PreK Spending (NIEER)	164	60	289	53	125	80

Notes: Before UPK defined as the five years before UPK implementation. After UPK defined as the year of implementation plus the next five years. Difference is in percentage points. Spending values are in millions of 2023 dollars.

change over time in the share of four-year-olds enrolled in public PreK prior to UPK implementation (event year zero). After implementation, there is a clear increase of about 19 percentage points in the share of four-year-olds enrolled in public PreK. These results support the notion that there were no differential trends in public PreK enrollment before UPK implementation in UPK areas, but a sharp and sudden increase occurred within two years of implementation.

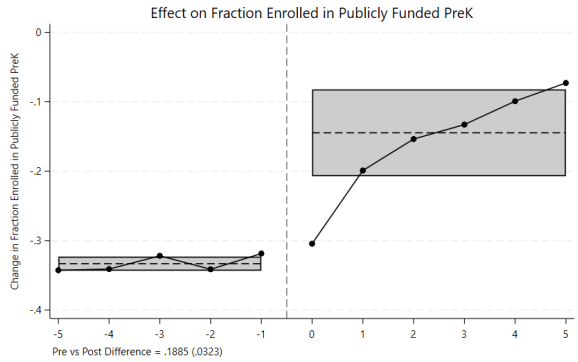
Although the NIEER data are of high quality, they only begin in 2002 and therefore do not fully capture the UPK implementation period for early adopters. To address this limitation, we supplement these data with CPS and ACS data, which collects information on children's school enrollment. Figure 2 panel (b) presents an event study plot for the fraction of four-year-olds enrolled in public PreK using CPS and ACS data, which cover all UPK states. While these estimates are somewhat noisy, with fluctuations before UPK implementation, there is a 9 percentage point increase in the share of four-year-olds enrolled in public PreK following UPK implementation (p-value< 0.01). It is worth noting that the CPS/ACS estimates are somewhat smaller than those from the NIEER data. When we restrict the ACS/CPS analysis to the events covered by the NIEER, the estimated increase is 13.5 percent, indicating that the differences largely reflect data differences rather than compositional effects. One potential reason for this difference is that some private PreK programs may be state-funded, meaning that increases in publicly funded PreK slots in private centers are reflected in the NIEER data but not in the CPS/ACS.[10] Despite these differences, the overall pattern—a substantial statistically significant

[10]NIEER measure "publicly funded" PreK and some states subsidize private centers or provide vouchers that can be used to attend public or private PreK. For example, D.C. provides funding to community-based organizations,

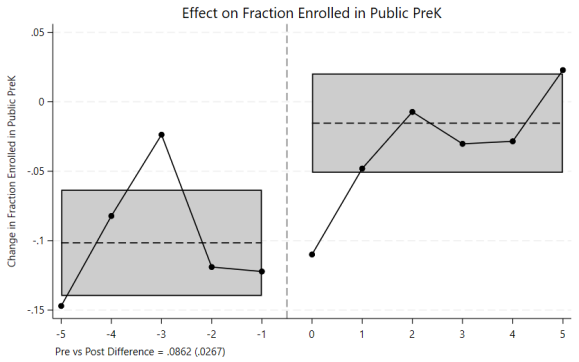
increase in public PreK enrollment following UPK implementation—is consistent across both datasets.

Figure 2: Effect of UPK on Public PreK Enrollment and Total Enrollment among 4-Year-Olds

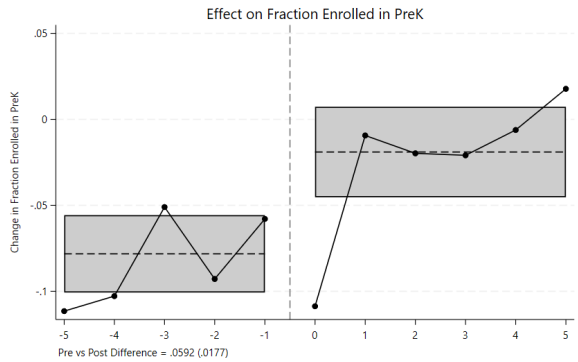
(a) NIEER Data (Publicly Funded PreK)



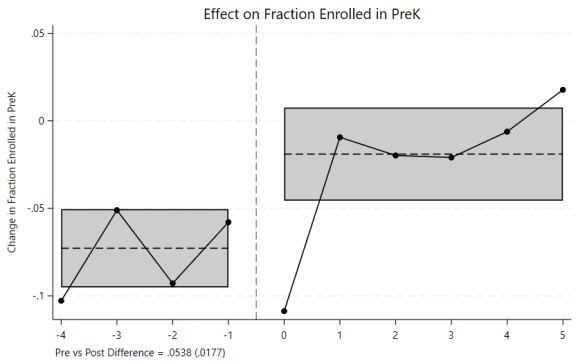
(b) ACS-CPS Data (Public PreK)



(c) ACS-CPS Data (Public and Private PreK)



(d) ACS Data (Public and Private PreK)



Note: Panel (a) shows the effect of UPK introduction on publicly funded PreK enrollment using NIEER data. Since NIEER data starts in 2002, UPK states include IA, WI, DC, VT, and NYC. Panels (b) and (c) show the effect on public PreK enrollment and total enrollment using ACS/CPS data. Panel (d) shows the effect on total enrollment using ACS data. UPK introductions that occur before 2008 (GA, OK, WV, FL, and IA) use CPS data in their stack. All other stacks (WI, DC, VT, and NYC) use ACS data.

Since many children may switch from private to public PreK once it becomes publicly available—as observed in Boston (Weiland et al., 2020) and New Haven (Humphries et al., 2024b)—we examine whether these large Universal PreK (UPK) programs actually increased *overall* enrollment of four-year-olds in PreK. To assess this, we calculate the annual proportion of four-year-olds enrolled in any school (PreK or otherwise) in each location and, using a stacked event study design, test whether this enrollment share increased following the introduction of UPK. The event study plot for overall PreK enrollment, regardless of type, is shown in Figure 2 panel (c) (using CPS/ACS data). Similar to public PreK enrollment, the share of four-year-olds enrolled in any PreK fluctuates without a discernible trend before UPK implementa-

including private childcare centers (DC, 2025).

tion. However, following UPK implementation, there is a statistically significant increase of 5.9 percentage points in the proportion of four-year-olds enrolled in any PreK (p-value< 0.01).

While formal tests indicate no differential pre-trending in overall PreK enrollment, the pre-treatment data are noisy enough to raise some concerns. To address this issue, we estimate the effects on the fraction of four-year-olds enrolled in any school using only the ACS. The ACS provides a larger sample size and greater statistical precision. Figure 2 panel (d) shows that the estimated effects are more precise, with standard errors approximately 40 percent smaller. The effect size is about 5.4 percentage points, and there is no visual evidence of differential pre-trending. This estimate is statistically indistinguishable from that obtained using the full sample, is more precise, and shows no evidence of differential pre-trending. These findings support the validity of the quasi-experimental design.

Taken together, the evidence shows that UPK implementation is associated with significant increases in public PreK enrollment—ranging from 11 to 25 percentage points. However, there is evidence of some crowd-out, resulting in an overall net increase in PreK enrollment among four-year-olds likely somewhere in the range of 4 and 8 percentage points.

5 UPK Effect on Aggregate Labor Market Outcomes

Having demonstrated that UPK increased the share of children enrolled in any PreK and potentially altered the intensity of PreK usage (e.g., a shift from part-time to full-time care), we now turn to examining its potential labor market effects. To explore the broader labor market implications of UPK, we present our event-study analysis on overall labor force participation and employment.

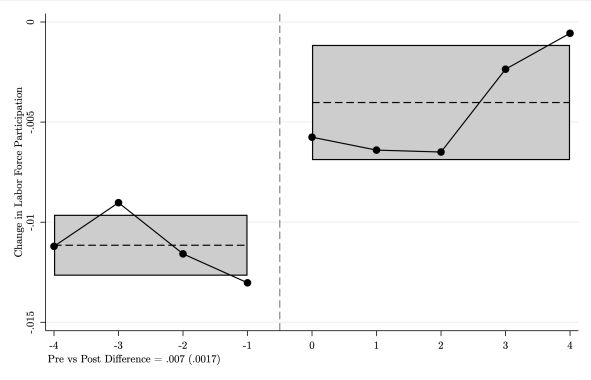
Figure 3 shows compelling of increases in labor market participation and employment overall. The data indicate a 0.7 percentage point increase in labor force participation in the full population. This increase is significant at the 1 percent level. Importantly, there is no evidence of any differential pre-trending in aggregate outcomes for areas that introduced Universal PreK. In the right panel, we plot the effects for the aggregate employment rate. These figures indicates an increase of about 0.9 percentage points (p-value< 0.01).

Note that the increase in the employment rate is slightly larger than the increase in the labor force participation rate. While this may seem counterintuitive at first glance, it can potentially be explained by some shifting of people from unemployment to employment. That is, there are two separate flows into employment: first, those entering the labor force from not in the labor force (NILF) are likely entering directly into employment ($N \Rightarrow E$); next, there are a small share of individuals moving from unemployment to employment as a result of the introduction of UPK ($U \Rightarrow E$) (see Figure A.1.) Although the effect on unemployment is relatively imprecisely estimated (likely due to the relatively small pool of unemployed individuals), we provide suggestive evidence that movement from both $N \Rightarrow E$ and $U \Rightarrow E$ is generating a larger employment effect than LFPR effect. Recent evidence from France studies the contribution of search

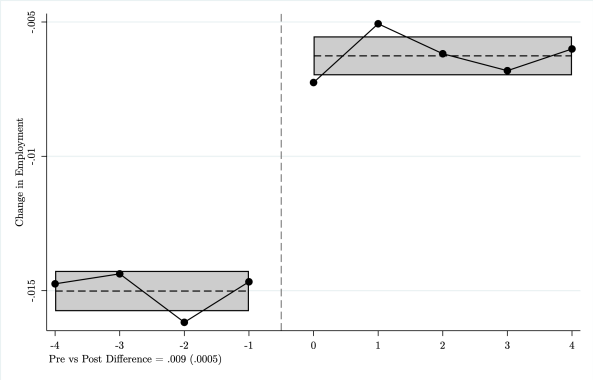
friction to the so-called "child-penalty" that women with children face; Philippe and Skandalis (2023) show that mothers submit fewer job applications and are more selective about wages and amenities. Importantly, the authors highlight that there are key differences in the timing of job search: mothers' rate of application decreases by more than 20% when their children are not in school. These results imply that parents with young children may face both lower incentives and higher costs to search: implications that are exacerbated in a setting where the cost to child care is traditionally high (CAP, 2021). Although Philippe and Skandalis (2023) focuses on mothers, the trade-offs are relevant for anyone with young children.

Figure 3: Effect of UPK Implementation on Employment Outcomes

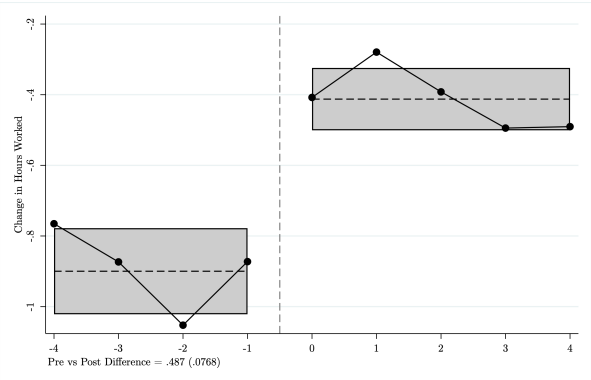
(a) Labor Force Participation Rate



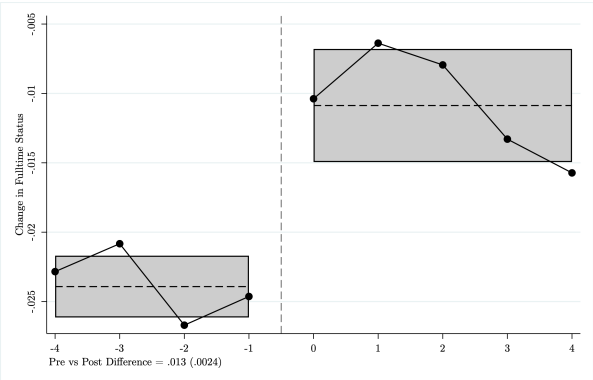
(b) Employment Rate



(c) Hours Worked Last Week



(d) Full-time Employment Rate

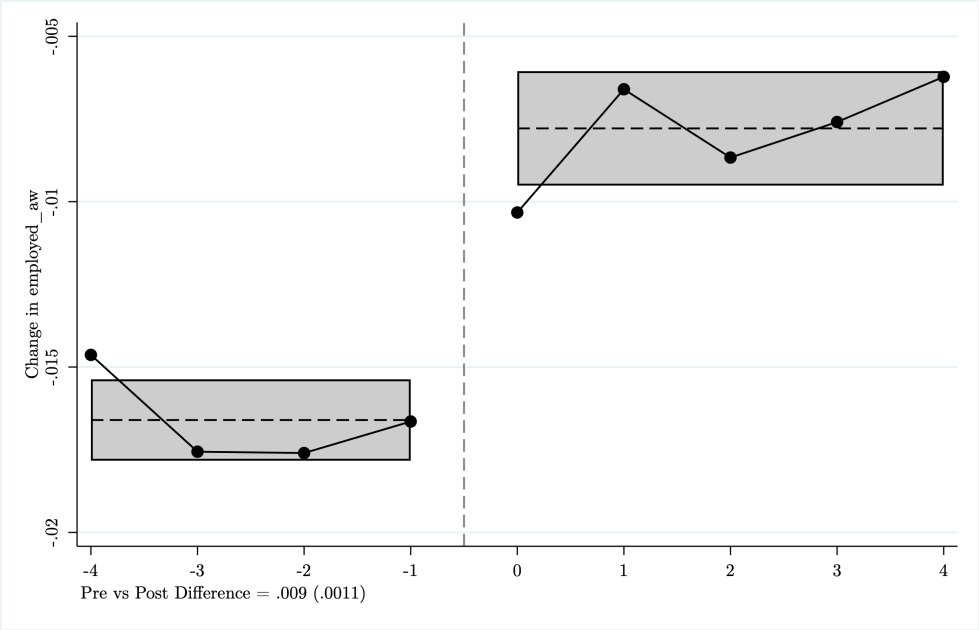


Note: Panel (a) shows the effect of UPK introduction on labor force participation rate. Panel (b) shows the effect on employment. Panel (c) shows the effect of UPK introduction on average hours worked last week. Panel (d) shows the effect on full-time status (defined as full-time hours (35+), usually full-time). All effects are estimated for all individuals over the age of 18. UPK introductions that occur before 2008 (GA, OK, WV, FL, and IA) use CPS data in their stack. All other stacks (WI, DC, VT, and NYC) use ACS data.

In addition to extensive margin employment effects, we see strong evidence of intensive margin effects overall. Panels (c) and (d) of Figure 3 shows the effect of UPK introduction on the share of individuals working full-time (defined as 35+ hours at work last week) and the average total number of hours worked last week. The left panel shows an increase of roughly

half an hour of work per week, and the left panel shows a 1.3 percentage point increase in the share of individuals who report working full-time. Importantly, the increase in the percentage of individuals who report working full-time is larger than the increase in those who report working at all. This implies that, while some of the increase in full-time work was driven by new employees, a nontrivial share is due to existing workers shifting from part-time to full-time work —- reinforcing the importance of considering the effect of UPK on labor flows. Finally, Figure 4 limits the reporting of employment to those indicating that they are not just employed, but that they are currently "at work." The distinction between employed and employed (at work) is slight, but the latter captures those who are not currently on leave for any reason (medical leave, vacation, etc.). In the full sample, the effect on employed (at work) is the same as the effect on all employment, which suggest that the effect of UPK introduction on employment is not simply capturing individuals returning to or remaining in employment while on parental leave.

Figure 4: Effect of UPK Introduction on "At Work" Status



Note: The figure shows the effect of UPK introduction on the share of individuals reporting they are employed (at work). Effects are estimated for all individuals aged 18-65. UPK introductions that occur before 2008 (GA, OK, WV, FL, and IA) use CPS data in their stack. All other stacks (WI, DC, VT, and NYC) use ACS data.

5.1 Can This All Be Explained By Maternal Employment?

The results thus far reveal sizable benefits of UPK for local labor markets in aggregate. Since mothers of young children are often the primary caregivers, they are more directly impacted by the availability of child care. As such, one would expect the effect of UPK to be most pronounced for this group. To assess this, we now evaluate whether Universal PreK programs

have, on average, increased maternal labor supply and employment to a greater extent than the population as a whole.

The pre-post contrast among mothers of young children, shown in Table 3, indicates that UPK increased the labor force participation of mothers of young children by 3 percentage points (p-value < 0.01) and overall employment by 2.9 percentage points (p-value < 0.01). Reassuringly, these estimates are almost identical to those found using variation in eligibility for PreK based on the age of children (Ilin et al., 2021).

Table 4: Effects of UPK Introduction on Labor Market Outcomes

	All		Moms of Young Kids		Not Moms of Young Kids	
	(1)	(2)	(3)	(4)	(5)	(6)
Labor Force Participation	0.002	0.007***	0.022***	0.030***	0.001	0.005**
	(0.002)	(0.002)	(0.006)	(0.006)	(0.002)	(0.002)
Employment	0.005***	0.009***	0.020**	0.029***	0.005***	0.008**
	(0.001)	(0.001)	(0.009)	(0.009)	(0.002)	(0.001)
Full-time Status	0.011***	0.013***	0.014	0.016**	0.010***	0.013***
	(0.002)	(0.002)	(0.009)	(0.007)	(0.002)	(0.003)
Hours Worked	0.337***	0.487***	0.638*	0.803**	0.306***	0.463***
	(0.077)	(0.077)	(0.381)	(0.370)	(0.108)	(0.109)
Controls		X		X		X

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Notes: Table shows estimates from pre-post event studies using specified samples. Not moms of young kids sample includes all individuals *except* women between the ages of 18 and 65 who have a child under 5. UPK introductions that occur before 2008 (GA, OK, WV, FL, and IA) use CPS data in their stack. All other stacks (WI, DC, VT, and NYC) use ACS data. Specifications that include controls include region fixed effects.

One key contribution of this work is to establish that the effects of UPK on the broader economy extend beyond young mothers. Specifically, survey data indicate that about 20% of U.S. adults are informal caregivers for family members or friends (Edwards, 2020), and between one-third and one-half of children under five receive informal care from family, friends, or neighbors (Early Edge California, 2024). Insofar as UPK reduces the need for these informal arrangements, these facts suggest that UPK's employment effects may extend well beyond mothers. In fact, survey evidence indicates that the proportion of the population potentially affected by UPK is much larger than that of mothers of young children (who constitute only about 6% of the adult population). In addition, UPK could influence the labor decisions of *potential* mothers through anticipatory effects. Broader demand-side impacts—such as increased demand for restaurants or transportation due to additional workers—could also enhance labor outcomes for individuals other than mothers of young children. While these mechanisms suggest that

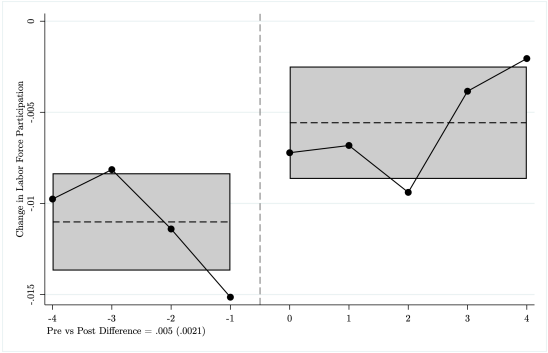
UPK may improve outcomes for a broader segment of the population, some groups could experience worse outcomes. For example, higher labor force participation among young mothers might crowd out employment opportunities for other workers (Fukui et al., 2023). The extent to which UPK has effects outside that on mothers of young children is an empirical question.

Taking these ideas seriously, we conduct a simple back-of-the-envelope calculation. Mothers of young children constitute only about 6% of the working-age population, so a 3-percentage-point increase in their labor force participation and employment would lead to roughly a 0.0018 increase in the aggregate. However, the overall effects (see Table 3) are 0.007 and 0.009 for labor force participation and employment, respectively. Both of these aggregate effects are about 4 to 5 times larger than what would be implied if the results were driven solely by mothers of young children—suggesting broader UPK benefits. To examine this more formally, we estimate the UPK effects for the working-age population, excluding mothers of young children (see third column).

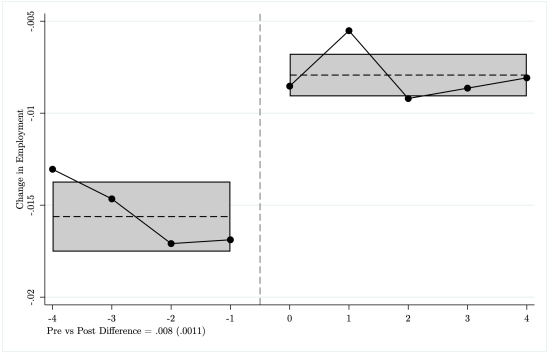
Consistent with young mothers contributing to the effect, our results are smaller when excluding mothers of young children, but the effects are not zero—indicating broader UPK effects. Specifically, the point estimates reveal that among adults who are not mothers of young children, labor force participation increased by 0.5 percentage points (p-value < 0.01) and employment increased by 0.8 percentage points (p-value < 0.01). The reduction in the effect when excluding young mothers is 0.002 for labor force participation and 0.001 for employment—closely aligning with the reductions implied by the back-of-the-envelope calculation. Figure X presents the event-study plot of the effects on the population excluding mothers of young children. Consistent with causal effects, the increases are not a continuation of any differential pre-trends and emerge only after UPK implementation.

Figure 5: Effect of UPK Introduction on Outcomes Excluding Mothers of Young Kids

(a) Labor Force Participation Rate



(b) Employment Rate



Note: The first panel shows the effect of UPK introduction on labor force participation rate. The second shows the effect on employment. Both effects are estimated for all individuals over the age of 18 who are *not* mothers of young children. UPK introductions that occur before 2008 (GA, OK, WV, FL, and IA) use CPS data in their stack. All other stacks (WI, DC, VT, and NYC) use ACS data.

5.2 Exploring Heterogeneity

As highlighted in Fitzpatrick (2010) and Cascio and Schanzenbach (2013), UPK may not always be effective in enhancing labor market outcomes, underscoring the prevalence of heterogeneity. To shed light on this, we first explore whether the labor market effects are more or less pronounced in UPK programs that enroll more children. To this end, we estimate UPK effects on public PreK enrollment and labor market outcomes for each state. We then examine the relationship between the state-level estimates of the impact of UPK program introduction on public PreK enrollment and those on labor market outcomes. Because the estimated effects at the state level are quite noisy, there are nontrivial estimation errors that may lead to some attenuation bias. Nonetheless, the relationship between these variables is instructive.

The top panel of Figure A.2 plots the state-level estimates of UPK introduction on labor supply against public PreK enrollment (measured in the ACS and CPS). The figure focuses on labor force participation and employment. The top panel shows a positive relationship between access and labor market outcomes. The slopes of these lines, although clearly positive, are imprecisely estimated, likely due to both sample limitations and measurement noise (see, for example, discussion of noise in Section 4). Interpreted directly, a 10 percentage point increase in the share of 4 year olds enrolling in public PreK is associated with a 0.35 percentage point increase in the labor force participation rate, and a 0.45 percentage point increase in the employment rate.

The key exclusion restriction is that the labor market effects are driven by changes in public PreK enrollment (rather than other changes that may have coincided with the introduction of UPK). While this exclusion restriction cannot be tested directly, one can assess whether the predicted effect on outcomes is zero when there is no predicted change in public PreK enrollment. Across all outcomes, the linear relationship predicts near-zero effects in the absence of a public PreK enrollment response, supporting the notion that the overall labor market effects are driven by PreK enrollment rather than merely by improvements associated with expanding UPK per se.

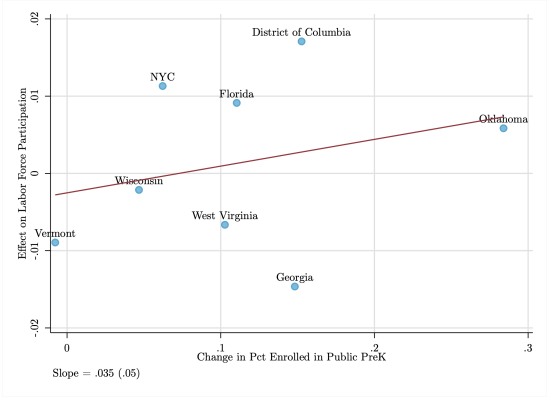
To address the noise in the estimated state-level enrollment effects, one could, in principle, use estimated effects on public PreK enrollment from the NIEER data. However, since these data are only available starting in 2002, estimates can only be obtained for a limited number of states (see Appendix Figure A.3 for these plots). To address the issue of noise, while also providing information for all states, we correlate UPK effects on labor market outcomes on the NIEER access rating from 2023. This rating essentially ranks areas based on the percentage of four-year-olds enrolled in public PreK. Thus, ambitious UPK programs that serve a larger share of four-year-olds receive higher rankings than those with lower enrollment rates.[11] The lower panel plots the estimated effects on labor market outcomes against the NIEER ratings. The patterns reveal a clear linear relationship between the access rating and the effect of UPK on labor

[11] Note that we impute the NIEER rating for NYC based on data from New York State. [explain]

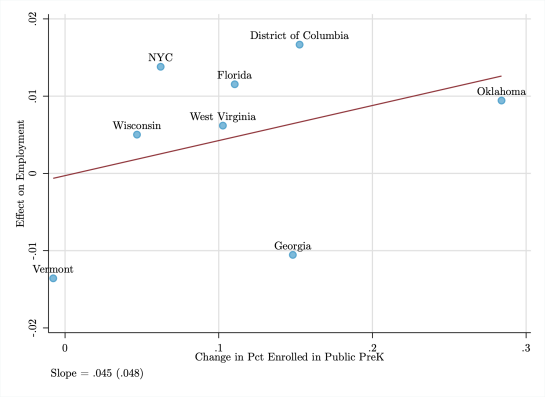
market outcomes across different areas. For both labor force participation and overall employment, places that serve a larger share of four-year-olds experienced greater UPK impacts, and we strongly reject the null hypothesis that these effects are zero at the one percent significance level.

Figure 6: Changes in PreK Enrollment and Aggregate Labor Market Outcomes

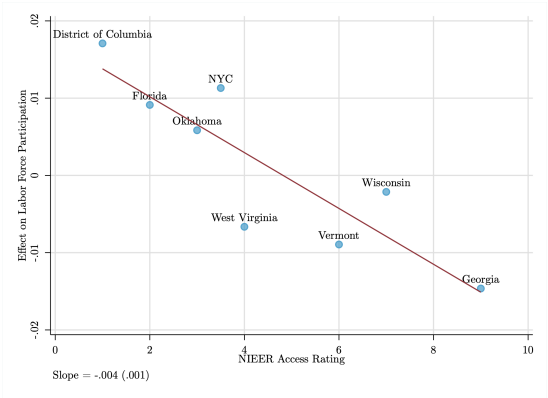
(a) Labor Force Participation Rate



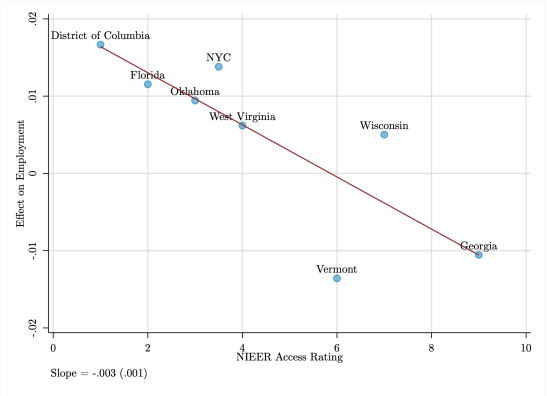
(b) Employment Rate



(c) Labor Force Participation Rate (NIEER Ranking)



(d) Employment Rate (NIEER Ranking)



Note: The first panel shows the estimate of labor force participation rates before and after the introduction of UPK plotted against public PreK enrollment before and after the introduction of UPK by state. The second panel shows the same relationship with employment on the y-axis. The bottom panels show the same labor supply outcomes on the y-axis plotted against NIEER access ratings on the x-axis. Labor market and PreK enrollment outcomes are measured using the ACS and CPS as discussed above.

6 The Exemplar Case of D.C.

Research has often highlighted that the likely effects of Universal PreK will depend on key details of implementation – such as whether PreK is full day or half day, or if services are provided in public schools, whether aftercare services are provided, and other dimensions.

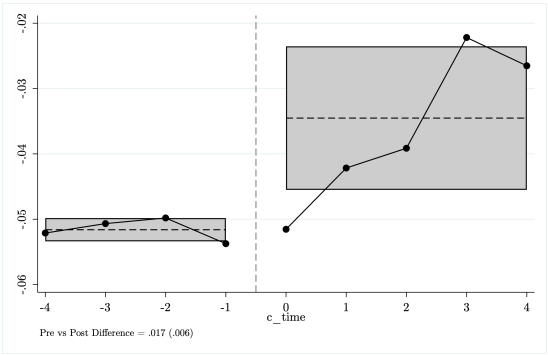
In almost every dimension, Washington D.C.'s UPK program stands out. First, the program is exceptionally well-funded, with $22,207 per child allocated annually in 2023–more

than twice that spent in any other state UPK program.[12] D.C. provides full-day PreK to all 3- and 4-year-old residents, regardless of income, contrasting with many areas that offer PreK exclusively to four-year-olds (Florida and Georgia, among others). The full-day structure is particularly significant, as some states only guarantee half-day PreK. For instance, while New York City provides full-day UPK for all students, other areas in the state face challenges due to a high proportion of seats offering only half-day education. The importance of full-day schooling is highlighted as a key feature in Humphries et al. (2024b) and tested directly in Gibbs et al. (2024), which finds that full-day kindergarten (relative to part day) expansions significantly increased parental labor supply and reduced commuting time, allowing for effects on the extensive and intensive margins.[13]

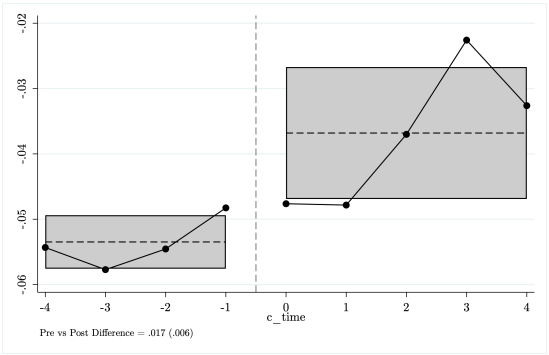
D.C.'s program also operates through a mixed-delivery system, encompassing public schools, charter schools, and community-based organizations. This approach enhances flexibility and accessibility, allowing families to choose options that best meet their needs. Finally, D.C.'s PreK program is also recognized for its high quality. On observable dimensions of classroom and center quality, D.C. ranks the highest of any state or territory (NIEER, 2024). Research supports the program's effectiveness. A study by Braga et al. (2024) utilized exogenous variation in PreK admission and found that PreK3 students are more likely to persist in the public system and remain in the same school, indicating positive long-term educational engagement. Given these attributes, Washington, D.C.'s UPK program serves as a compelling case for further study, offering valuable insights into the impact of well-funded, inclusive, and high-quality early childhood education initiatives.

Figure 7: Effect of UPK Introduction on Labor Force Participation and Employment in DC

(a) Labor Force Participation Rate



(b) Employment Rate



Note: The first panel shows the effect of UPK introduction on labor force participation rate in Washington, DC. The second shows the effect on employment. Both effects are estimated for all individuals ages 18-65. Effects are estimated using ACS data only.

[12]The next closest state per-child spending is New Jersey, which spends about $16,000 per child but does not have a qualifying UPK program. New Jersey (and other states that have high per-child state spending on PreK (Oregon, California, Arkansas, Washington) all enroll a small fraction of four-year-olds in PreK (under 25%).

[13]Note that Gibbs et al. (2024) studies the targeted impact of full-day kindergarten expansion on families with Kindergarten-aged children, whereas our paper restricts to children who are too young to be Kindergarten-eligible. Our results are thus compatible with Gibbs et al. (2024) without measuring overlapping impacts.

Figure 7 shows effect sizes nearly double those in the full sample. Panel (a) indicates a 1.7 percentage point increase in labor force participation rate in the full D.C. population following the introduction of UPK (p-value< 0.01). Panel (b) shows a nearly identical effect on employment. Note that the gap between LFPR and employment effects discussed in Section 5 do not appear to be at play in D.C., instead suggesting that the entire increase in labor force participation could be due to individuals moving from NILF status to employment. Importantly, there is little evidence of differential pre-trending in aggregate outcomes in D.C. compared to control states. In these analyses, D.C. is compared to the same group of control states used in the main analysis (i.e., Figure 3), other treated states are dropped from the sample. These relatively large impacts on labor supply in response to the introduction of UPK in D.C. highlight the importance of accessible, high-quality programs. while the strong results in D.C. are an important part of our analysis, Appendix Table A.2 shows that our main results are similar (albeit slightly smaller) when excluding D.C..

7 Effects on Aggregate Earnings

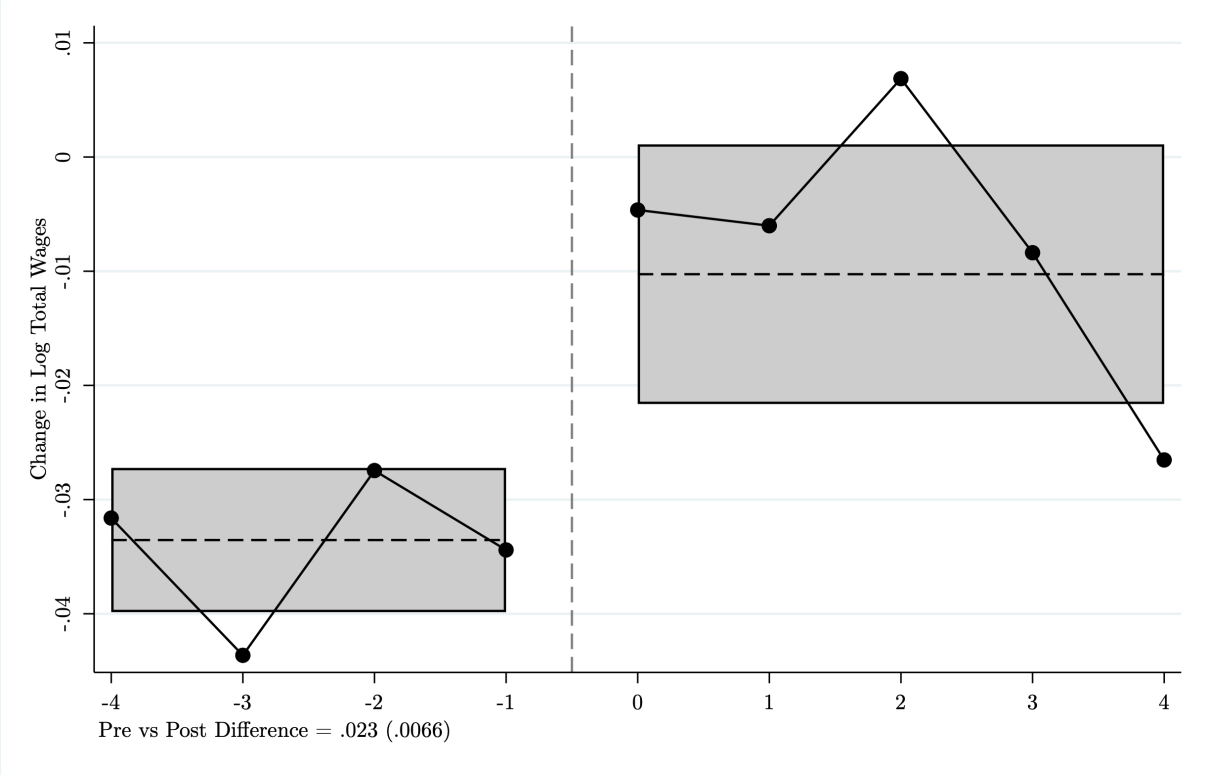
To provide further evidence on market-wide effects, we examine aggregate wages paid using data from the CPS and ACS. Aggregate earnings serve as a strong measure of overall economic output for a given location. Because aggregate earnings can be influenced by population growth, we also control for the log of the population for this analysis.[14] Figure 8 shows that after the implementation of Universal PreK, state-level total real wages increased by approximately 2.3 percent. This is consistent with the increases in employment. That is an increase in the employment of 0.9 percentage points, which is roughly 1.5 percent. Consistent with this, there was an increase of about 1.7 in hours worked after UPK implementation. Holding wages constant, one would expect an increase in earning between 1 and 2 percent – a range that is has considerable overlap with the confidence interval of the estimate UPK effect on aggregate wages [0.01 , 0.036]. Indeed, we find no effect of UPK on average wages- suggestive of highly inelastic labor demand.[15] Importantly, the results show that the introduction of UPK generated more overall economic activity — consistent with it serving as supply side stimulus.

We can use these estimates to assess the broader economic benefits of UPK. The pre-treatment average of aggregate wages was $45 billion, so a 2.3 percent increase corresponds to a rise in aggregate earnings of approximately $1 billion. To put this into perspective, we estimate that state spending on PreK increased by roughly $110 to $170 million following UPK implementation. Taken at face value, this implies that each dollar spent on PreK is associated with an increase of $6 to $10 in additional earnings. This result is consistent with—though somewhat smaller than—estimates from Humphries et al. (2024b), who report $10 in additional parental earnings for each dollar spent on UPK in New Haven.

[14] We find that UPK states may have have faster population growth after UPK implementation.

[15] We find a UPK effect on the hourly wage of 0.0003 (se=0.0004). This is a precisely estimated null effect.

Figure 8: Effect of UPK Introduction on Total Wages CPS/ACS (with population controls)



Note: Note: The figure shows the effect of UPK introduction on log total real wages as measured by the ACS/CPS for all UPK states. Specification includes region by year fixed effects as well as a control for state-level log population.

An important implication of this result is that UPK could conceivably pay for itself. If income is taxed at an average rate of 20% (considering both federal and state income taxes), then each dollar spent on UPK generates between $1.20 and $2.00 in tax revenue. This suggests that the additional tax revenue—at both the state and federal levels—could be sufficient for UPK programs to be self-sustaining, even in the short run. However, because a substantial portion of the increased tax revenue flows to the federal government rather than to the states, state governments may not fully recoup the costs of implementing these programs – leading to a fiscal externality. This underscores the potential efficiency of federal subsidies for state UPK programs, rather than relying solely on state funding (Agrawal et al., 2022).

8 Conclusions

This paper provides compelling evidence that UPK programs have significant and far-reaching economic effects beyond the direct impact on parents of preschool-aged children. Looking beyond mothers of young children, this study shows that the introduction of UPK programs increases labor supply on both extensive and intensive margins for a broad set of workers, ul-

timately leading to greater overall economic activity as reflected in higher aggregate earnings. Importantly, we show that these effects cannot be fully explained by changes in maternal employment alone—highlighting the broader labor market impacts of UPK.

Another key innovation of the paper is our exploration of heterogeneity in UPK impacts. We demonstrate that the scale and quality of UPK programs matter. More ambitious programs, such as the one in Washington, D.C., yield considerably larger economic benefits, reinforcing the importance of both access and quality in the implementation of early childhood education policies.

Additionally, we compare increases in public PreK spending to increases in aggregate earnings to estimate the overall impact of UPK introduction. We find that the economic returns from UPK programs are substantial—generating between roughly six and ten dollars in additional aggregate earnings per dollar spent – findings consistent with direct effects on parents from Humphries et al. (2024b). The magnitude of this effect indicates that UPK has a high benefit-cost ratio. In this context, there is a fiscal externality because while state governments fund most UPK programs, much of the increased tax revenue from higher employment and earnings flows to the federal government. This creates a mismatch between who pays and who benefits, making federal subsidies more efficient than relying solely on state funding.

This study fills gaps in the literature by examining the broader market-level impacts of UPK introduction across the country and providing a rationale for inconsistencies in prior findings. Taken together, our results support the idea that, beyond being a crucial investment in early childhood education—-one with well-documented long-term benefits (Gray-Lobe et al., 2022; Berne, 2022)–UPK can also serve as a significant supply-side economic intervention when implemented in a way that promotes broad access and high quality.

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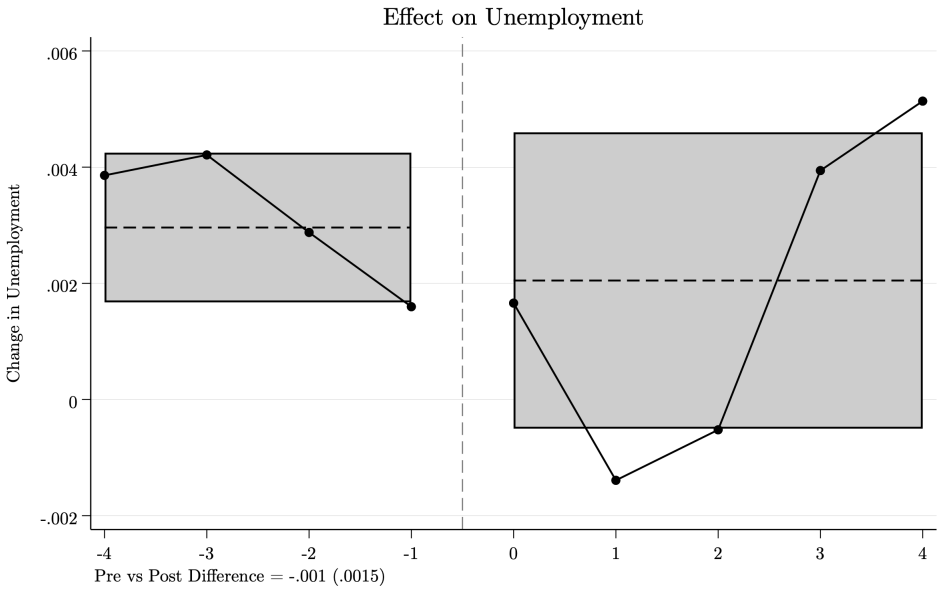
A Appendix

Table A.1: Employment Statistics: ACS and CPS Comparison

	Employment Rate		LFPR		Hours Worked		Average Total Income		Average Total Wages	
	ACS	CPS	ACS	CPS	ACS	CPS	ACS	CPS	ACS	CPS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1990	60.1%	60.4%	66.1%	66.4%	27.9	24.0	45,951	45,566	34,802	33,317
2000	61.6%	62.9%	67.0%	68.0%	29.2	25.1	53,481	52,022	40,773	38,895
2001	61.1%	62.5%	67.1%	67.9%	28.7	24.7	53,910	53,911	40,830	40,938
2002	60.4%	61.2%	67.3%	67.4%	28.4	24.1	53,871	54,263	40,920	41,794
2003	60.2%	60.9%	67.2%	67.2%	28.1	23.9	52,551	52,517	39,939	40,746
2004	60.2%	60.7%	67.1%	66.7%	28.1	23.9	53,372	52,601	40,374	40,291
2005	60.5%	61.0%	67.1%	66.5%	28.2	24.0	53,599	52,146	40,619	40,043
2006	59.9%	61.2%	66.2%	66.8%	27.8	24.0	52,024	52,789	39,190	40,181
2007	59.8%	61.8%	66.1%	67.2%	27.7	24.3	53,343	53,807	40,034	40,977
2008	61.1%	61.5%	67.2%	67.0%	27.4	24.1	52,754	52,600	39,751	40,229
2009	58.4%	58.6%	66.7%	66.5%	26.4	22.5	51,754	53,021	38,940	40,646
2010	57.2%	57.5%	65.9%	65.9%	25.5	22.0	49,288	50,974	36,767	38,593
2011	57.2%	57.5%	65.4%	65.2%	25.3	22.0	48,487	49,399	36,164	37,272
2012	57.7%	57.6%	65.3%	65.0%	25.4	22.1	48,566	49,759	36,233	37,722
2013	58.0%	57.6%	65.0%	64.5%	25.5	22.3	49,366	50,209	36,896	38,139
2014	58.4%	58.1%	64.6%	64.2%	25.5	22.4	49,679	51,346	37,118	38,502
2015	58.8%	58.5%	64.5%	63.9%	25.7	22.7	51,851	52,511	38,571	39,409
2016	59.2%	59.1%	64.5%	64.1%	25.8	22.9	52,892	54,473	39,576	41,043
2017	59.5%	59.0%	64.5%	64.1%	25.9	22.8	53,496	55,729	40,101	41,918
2018	59.9%	59.4%	64.6%	64.0%	26.0	23.0	54,393	56,465	40,670	42,171
2019	60.3%	59.9%	64.8%	64.2%	25.9	23.3	56,332	57,797	41,604	43,100
2020	57.4%	57.9%	63.7%	63.8%	25.7	22.3	57,155	61,620	41,975	45,321
2021	58.5%	56.9%	64.3%	62.7%	25.4	22.1	56,908	59,751	41,984	43,203
2022	60.3%	59.2%	64.7%	63.4%	25.9	23.0	56,251	58,176	41,880	42,443

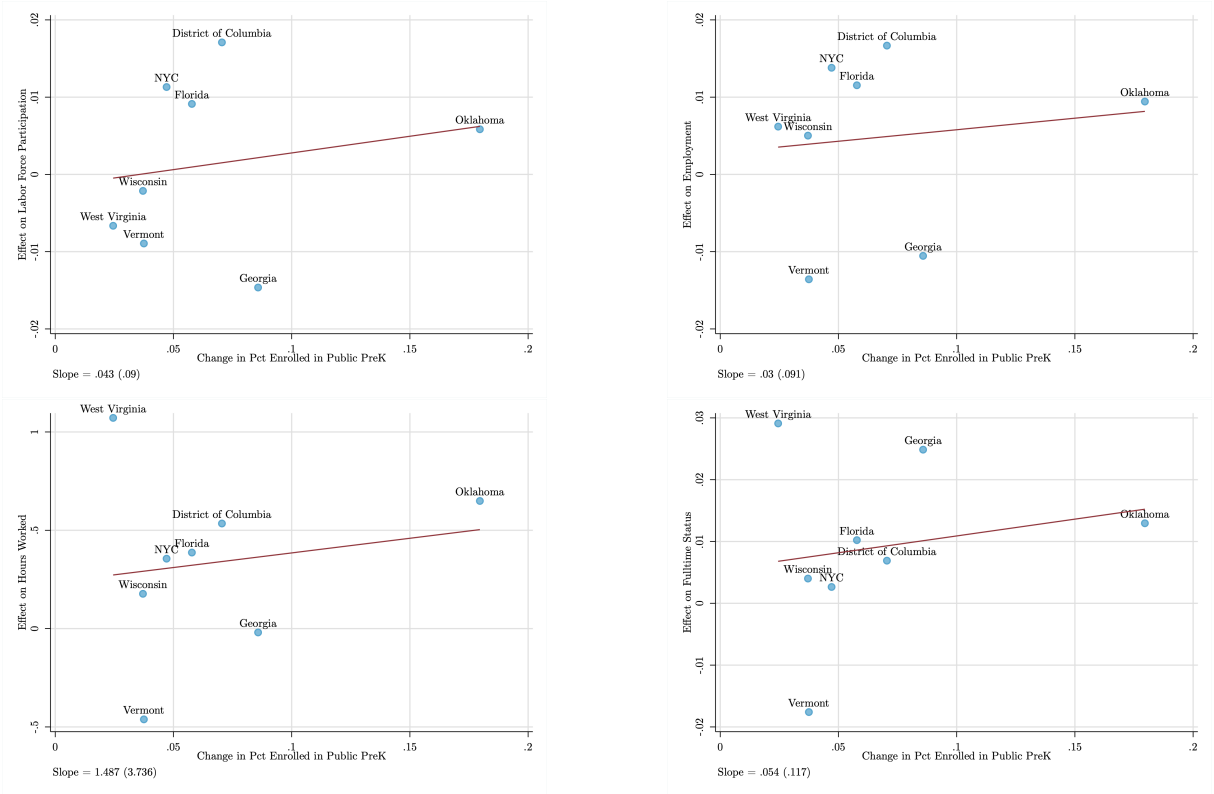
Notes: Summary statistics presented above use full samples from both ACS and CPS. Average of each variable are computed using perwt in ACS and asecwt in CPS (ASEC sample used).

Figure A.1: Effect of UPK Introduction on Unemployment Rate



Note: The figure shows the effect of UPK introduction on unemployment rate. The effect is estimated for all individuals over the age of 18. UPK introductions that occur before 2008 (GA, OK, WV, FL, and IA) use CPS data in their stack. All other stacks (WI, DC, VT, and NYC) use ACS data.

Figure A.2: Changes in Any PreK Enrollment and Aggregate Labor Market Outcomes



Note: The first panel shows the estimate of labor force participation rates before and after the introduction of UPK plotted against public PreK enrollment before and after the introduction of UPK by state. The second panel shows the same relationship with employment on the y-axis. The bottom panels show hours worked and full-time status effects on the y-axis. Labor market and PreK enrollment outcomes are measured using the ACS and CPS as discussed above.

Table A.2: Effects of Policy on Labor Market Outcomes (Excluding DC)

	All		Moms of Young Kids		Not Moms of Young Kids	
	(1)	(2)	(3)	(4)	(5)	(6)
Labor Force Participation	0.002	0.006***	0.022***	0.032***	0.001	0.004**
	(0.002)	(0.001)	(0.006)	(0.009)	(0.002)	(0.002)
Employment	0.005***	0.008***	0.020**	0.032***	0.005***	0.007***
	(0.001)	(0.001)	(0.009)	(0.010)	(0.002)	(0.002)
Full-time Status	0.011***	0.014***	0.014	0.018***	0.010***	0.014***
	(0.002)	(0.003)	(0.009)	(0.006)	(0.002)	(0.004)
Hours Worked	0.337***	0.488***	0.638*	0.840**	0.306***	0.465***
	(0.077)	(0.101)	(0.381)	(0.353)	(0.108)	(0.140)
Controls		X		X		X

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Notes: Table shows estimates from pre-post event studies using specified samples. Not moms of young kids sample includes all individuals *except* women between the ages of 18 and 65 who have a child under 5. UPK introductions that occur before 2008 (GA, OK, WV, FL, and IA) use CPS data in their stack. All other stacks (WI, DC, VT, and NYC) use ACS data. Specifications that include controls include region fixed effects.

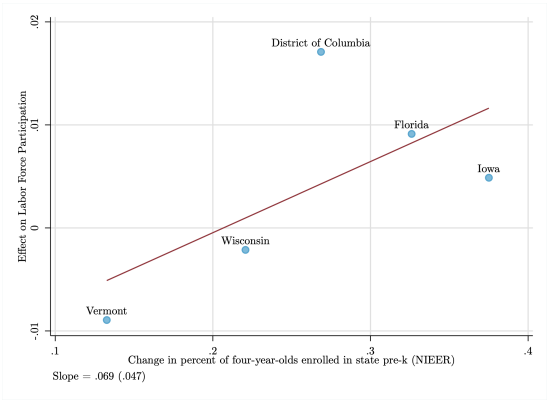
Table A.3: Pre-K Enrollment Estimates

	(1)	(2)	(3)
Public Pre-K Enrollment	0.113***	0.086***	0.087***
	(0.019)	(0.027)	(0.027)
Private Pre-K Enrollment	-0.042**	0.002	0.000
	(0.018)	(0.022)	(0.021)
Total Pre-K Enrollment	0.076***	0.059***	0.060***
	(0.024)	(0.018)	(0.018)
Stack x Year FE	X	X	X
State FE	X	X	X
Region x Year FE		X	X
Bartik Controls			X

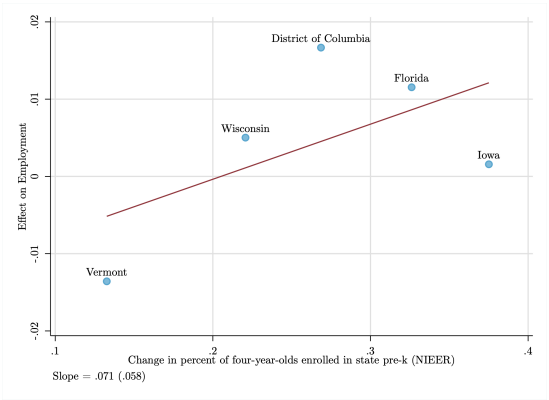
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Notes: Table shows estimates from pre-post event studies using enrollment outcomes.

Figure A.3: Changes in PreK Enrollment (NIEER) and Aggregate Labor Market Outcomes

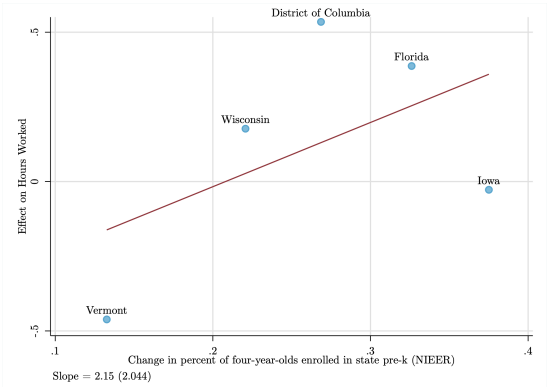
(a) Labor Force Participation Rate



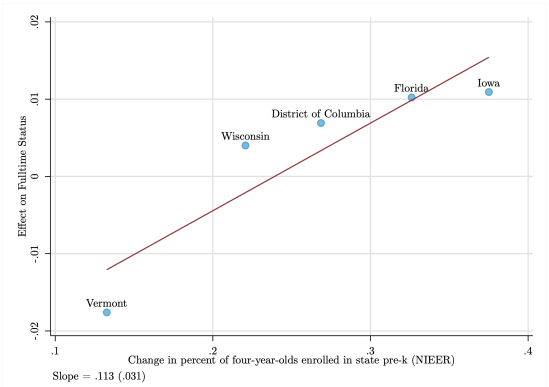
(b) Employment Rate



(c) Hours Worked Last Week



(d) Full-time Employment Rate



Note: The first panel shows the estimate of labor force participation rates before and after the introduction of UPK plotted against public PreK enrollment before and after the introduction of UPK by state. The second panel shows the same relationship with employment on the y-axis. The bottom panels show hours worked and full-time status effects on the y-axis. Labor market outcomes are measured using the ACS and CPS as discussed above; PreK enrollment outcomes are measured using share of four-year-olds enrolled in state PreK in the NIEER data.

Table A.4: Effects of Policy on Labor Market Outcomes

	All			Moms of Young Kids			Not Moms of Young Kids		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Labor Force Participation	0.002	0.007^{***}	0.003	0.022^{***}	0.030^{***}	0.032^{**}	0.001	0.005^{**}	0.001
	(0.002)	(0.002)	(0.003)	(0.006)	(0.006)	(0.012)	(0.002)	(0.002)	(0.003)
Employment (last week)	0.005^{***}	0.009^{***}	0.007^{**}	0.020^{**}	0.029^{***}	0.029^{*}	0.005^{***}	0.008^{***}	0.008^{***}
	(0.001)	(0.001)	(0.003)	(0.009)	(0.009)	(0.017)	(0.002)	(0.001)	(0.002)
Full-time Status	0.011^{***}	0.013^{***}	0.019^{***}	0.014	0.016^{**}	0.028^{*}	0.010^{***}	0.013^{***}	0.017^{***}
	(0.002)	(0.002)	(0.002)	(0.009)	(0.007)	(0.014)	(0.002)	(0.003)	(0.003)
Hours Worked (last week)	0.337^{***}	0.487^{***}	0.649^{***}	0.638^{*}	0.803^{**}	0.837	0.306^{***}	0.463^{***}	0.551^{***}
	(0.077)	(0.077)	(0.079)	(0.381)	(0.370)	(0.563)	(0.108)	(0.109)	(0.123)
Region $\times$ Year FE		X	X		X	X		X	X
Bartik Controls			X			X			X

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Notes: Table shows estimates from pre-post event studies using specified samples. Not moms of young kids sample includes all individuals *except* women between the ages of 18 and 65 who have a child under 5. UPK introductions that occur before 2008 (GA, OK, WV, FL, and IA) use CPS data in their stack. All other stacks (WI, DC, VT, and NYC) use ACS data. Specifications that include controls include region fixed effects.